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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/330,154	06/11/1999	SUSUMU GOTO	862.2866	9061
5514	7590	07/27/2004	EXAMINER	
FITZPATRICK CELLA HARPER & SCINTO			VANORE, DAVID A	
30 ROCKEFELLER PLAZA			ART UNIT	
NEW YORK, NY 10112			PAPER NUMBER	
			2881	

DATE MAILED: 07/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/330,154

Applicant(s)

GOTO, SUSUMU

Examiner

David A Vanore

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-15 and 29-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-15 and 29-45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 May 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

***Response to Arguments***

Applicant's arguments, filed June 16, 2004, with respect to the rejection(s) of claim(s) 1, 3-11, 15, 17-25, and 29-45 under Terashima et al. have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Terashima et al. and in view of Crewe.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-11, 15, and 29-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Terashima et al. in view of Crewe.

1) Terashima et al. teaches the following:

A charged particle source (Fig. 19 Item IL), an irradiation system for producing an arcuate shaped beam and irradiating said beam onto a mask (Fig. 19 Item IL), a projection optical system comprising a plurality of magnets (Fig. 19 Item 1008, 1010, and 1013), an acquisition means (Fig. 25 Item 1040) which determines image information for correction (Col. 21 Lines 38-61), and a controller to control the currents distributed to the magnets (Fig. 14 Item 40) where the control system comprises an aberration correction system and control circuit (1007 and 1034), a magnification system and control circuit (1008 and 1036), and a focus correction system (1013) coupled to an optical characteristic system (1037) as recited in claims 1-8, 15-25, and 29-45, where the control

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system and projection optical system adjust the optical characteristics of the beam and to correct any aberrations in the beams (Col. 13 Lines 35-45 and Col. 20 Line 32-59).

Regarding the newly added limitation “where a controller changes a distribution of an axial magnetic field”, in order to correct focus and magnification it is necessary that a distribution of an axial magnetic field be changed whenever a focusing operation is performed.

An acquisition system which comprises a mask (Fig. 25 Item 1006) which passes a predetermined beam portion and a measurement system which correlates the position of the wafer (Fig. 25 item 1016) and the mask to determine the and correct a pattern image projected on the wafer (Col. 21 Lines 38-61) as recited in claims 9-11.

Regarding the feature in claim 35 of a moving amount of the second principal plane is equal to a value obtained by multiplying a moving amount of the first principal plane by a magnification of a projection optical system while a moving direction of the first principal plane is the opposite direction to that of the second principal plane is not taught by Terashima et al. However, this feature was not claimed previously.

Regardless, this is a necessary consequence of changing the magnification of two or more lenses coupled in parallel in an optical device. Any change of the magnification applied by the first lens will be multiplied by the optical effect imparted on the optical beam by the second lens. In Terashima et al. for instance, the image produced downstream of reduction optical system 108 at or after lens 113 will move in accordance with a change in the settings of lenses 108a and 108b, necessarily. However, the motion of the image produced at or beyond lens 119 is multiplied by any magnification factor imparted by lens 113.

2) Terashima et al. fails to teach the following:

The correction of image distortion by moving the principal planes of at least one lens unit comprising two magnetic lenses such that third and fifth aberrations are corrected as recited in claims 1, 4-11, 15, and 29-45.

3) Crewe teaches the following:

Crewe teaches a charged particle beam system for the correction of third order and higher aberrations and image distortion where the projection optical system of Crewe comprises two units (32 and 34) having two magnetic lens each (Fig. 1) where the energization of the lenses shifts the principal planes of the units respectively and corrects image distortion and aberrations of the third and fifth order (Col. 2 Lines 37-66 and Col. 6 Lines 13-46).

4) The motivation to combine Terashima et al. and Crewe is as follows:

The device of Terashima et al. requires an electrostatic aberration correction mechanism (1007), and therefore cannot correct image distortion by alteration of the current flowing to the lenses alone. Crewe overcomes that limitation by obviating the need for the correction system (1007) through the selective and controllable excitation of magnet units 32 and 34, and in the process provides for the correction of image distortion of third and higher order aberrations.

5) It would therefore have been obvious to one having ordinary skill in the art at the time the invention was made to combine the aberration and image distortion correcting projection optical system of Crewe into the apparatus of Terashima et al. to provide a means for correcting image distortion and aberrations of third order and higher while materially simplifying the device of Terashima et al. by eliminating the need for a

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separate aberration correction means (1007) and in the process reducing the material size and complexity of the device of Terashima et al.

Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Terashima et al. and Crewe further in view of Sakamoto et al.

Regarding claims 12-13, Terashima et al. teaches all limitations as applied above but fails to teach an acquisition system with a substrate having a mark, a measurement unit to detect backscattered electrons, and a substrate stage which moves such that the position of the mark moves across the position where the charged particle beam becomes incident on the substrate stage.

Sakamoto et al. teaches a charged particle lithography apparatus comprising a mark (15, 17) composed of heavy metal (Col. 10 Lines 39-68), a backscattered electron detector, and a scanning stage which scans the position of the mark and determines the incident position of the charge particle beam by correlating the detected backscattered electrons with the stage position (Col. 5 Lines 30-44).

Sakamoto et al. modifies Terashima et al. to produce a charged particle lithography device with a backscattered electron detection and aligning means.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a backscattered electron detection and aligning means because Sakamoto et al. demonstrates that the incorporation of such a means in a charged particle lithography device is well known in the art.

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Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terashima et al., Crewe, and Sakamoto et al. as applied above, and in further view of Mori et al.

Terashima et al., Crewe, and Sakamoto et al. teach all limitations as applied above but fail to teach marks on a substrate shaped as a crisscross or composed of a heavy metal.

Mori et al. teaches a charged particle lithography apparatus comprising alignment marks (M1) in the shape of a crisscross and composed of heavy metal.

Mori et al. modifies Terashima et al. and Sakamoto et al. to produce a charged particle lithography apparatus having alignment marks on a wafer in the shape of a crisscross and composed of a heavy metal.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide alignment marks in the shape of a crisscross and composed of heavy metal on a substrate in a charged particle lithography apparatus because Mori et al. teaches that such a modification provides the necessary accurate alignment between a mask and semiconductor wafer (Col. 1 Lines 7-12).

### ***Conclusion***

The examiner has further cited US Patent 4,198,569 A to Takayama which discloses the use of magnetic lens doublets working cooperatively to correct image distortion and aberration in an electron exposure apparatus.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A Vanore whose telephone number is (571) 272-2483. The examiner can normally be reached on M-F 7:30-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dav

  
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